frontiers | Frontiers in Climate

TYPE Editorial
PUBLISHED 17 November 2022
DOI 10.3389/fclim.2022.1087219

OPEN ACCESS

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SPECIALTY SECTION
This article was submitted to Climate Risk Management, a section of the journal Frontiers in Climate

RECEIVED 02 November 2022
ACCEPTED 08 November 2022
PUBLISHED 17 November 2022

CITATION
Catacutan DC, Harvey CA, Öborn I and van Noordwijk M (2022) Editorial: Climate risk management in smallholder agriculture.
Front. Clim. 4:1087219.
doi: 10.3389/fclim.2022.1087219

Editorial: Climate risk management in smallholder agriculture

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KEYWORDS

smallholders, climate-smart, location-specific, adaptation, agriculture, smallholders agriculture

Editorial on the Research Topic
Climate risk management in smallholder agriculture

The Sixth assessment of the Inter-Governmental Panel on Climate Change (IPCC, 2021) has reconfirmed the growing scientific consensus that the earth's warming is due to anthropogenic increases in atmospheric greenhouse gas concentrations. With rising temperatures, climate change will result in increasingly unpredictable and variable rainfall, varying seasonal patterns and more frequent occurrence of extreme weather events. Climate change modifies the growing conditions for crops, weeds, pests, and diseases, affecting crop yields and placing significant pressure on agricultural systems and local livelihoods. Smallholder farmers are particularly vulnerable to the impacts of climate change due to their small farm sizes, limited access to capital and technical support and low adaptive capacity (Morton, 2007).

A range of smallholder adaptation options with various consequences at farm scale as well as for broader society have been reported in the literature: (1) abandon farming and seek urban jobs, (2) adjust crop, soil and/or water management practices for current crops, (3) shift to other sources of germplasm of current or "new" crops, (4) make use of trees to modify and buffer the microclimate in which crops grow and livestock is kept, (5) diversify production as risk mitigation measure, and (6) cooperate on market access and mutual crop insurance schemes.

The objective of this Research Topic is to explore the different ways in which smallholder farmers adapt to climate change in different contexts and highlight both the challenges and opportunities that farmers face in addressing climate risks.

Mushore et al. study in a local area in Zimbabwe found that climate change had a significant negative impact on the livelihoods and food security status of smallholder farmers, leading to food aid, use of traditional grains and other drought resistant crops, early planting, multiple planting, barter trade and livelihood diversification. The challenges identified for these adaptation responses included lack of markets to sell farming produce, inefficient institutions, poverty, and high climate variability.

A semi-arid area with sandy soils in south-eastern Kenya is an example of where smallholder farmers face increased drought risks (Nkurunziza et al.). The most-cited farmer response to climate change was early planting, reducing the area under cultivation and water harvesting. Experiments with a sub-surface water retention technology based on a low-density polyethylene film inserted at 25–40 cm depth improved water and nutrient retention and increased maize and cowpea yields, but data on the level of investment needed to implement this at scale was not yet available.

In Peru, Morales et al. study on climate adaptation across the coffee value chain concluded that the adaptive capacity of smallholder coffee farmers is the weakest part of the value chain, where traders can shift more easily to other source areas. The authors call for a territorial systems perspective that more intentionally involves those actors with stronger, locally vested interests (e.g., local governments and institutions), and strengthening their capacities to support farmers.

Barron et al. review how rural livelihoods can build resilience toward increased climatic variability in degraded agro-ecological landscapes in Ethiopia and Ghana. Beyond efforts to strengthen resilience through local action, the authors highlight the need for new knowledge, infrastructure, and social security mechanisms, including insurance and emergency assistance.

Barbon et al. reflect on a 3-year participatory action research effort in four unique agro-ecological zones in Myanmar. The climate-smart village approach made clear that in villages with high incidence of landlessness, adaptation options were limited to homesteads, the small patch of land around the household dwelling. A more secure tenure status provided farmers with freedom to engage in diversified and long-term production systems nurturing incremental adaptation through incremental learning.

Schmidt and Bunn conclude that for coffee landscapes, especially in Latin America, local farmers, policymakers, and global donors must unite to improve uptake of the wide array of tested climate-smart coffee-production practices in a coordinated way to manage possible conflicts, coordinate actions, provide finance and accommodate the required lead-time. This points the need for cross-learning about coffee production practices and climate shift analysis, with the social and cultural constraints that may apply.

Moreover, in the context of the Sustainable Development Goals, the target for climate change adaptation is not "just" bouncing back, but forward (also known as sustainagility) (van Noordwijk et al., 2022). Along this line, Hellin et al. plead for an intertwined social–ecological–technological systems approach to climate risk management with SDGs as integrative target. Cases examined include the Mekong delta (Vietnam) where risk maps for various cropping patterns helped to craft context-specific transformative adaptive programs at sub-national level; East and Southern Africa where index-based crop insurance for climate risks encouraged lenders to make loans for agricultural inputs, and on average increased yields; and in Guatemala wherein locally specific collective action approaches have reduced social tensions and enhanced climate change adaptation.

Together, the papers in this special edition highlight the multiple challenges smallholders face and the ways in which they respond to climate change. The papers also emphasize the need for local capacity development, infrastructure, social security schemes, planning and risk mapping, social capital, coordination, and support from relevant sectors to reinforce farm-level adaptation and further enable households to deal with more uncertainty and predictable change (trends), ultimately fostering transformational adaptation.

The collection of papers affirms that adaptation measures are highly context and location-specific, which means that adaptation measures need to be carefully tailored to the adaptive capacities and specific risks that smallholder farmers face in each location. This points to the need for location-specific diagnostic studies, as well as processes for linking farmers with other land use, value chain and local government actors, in joint learning on land resource capabilities and local climate change scenarios, supported by scientists.

Finally, the collection of papers suggests that joint analyses of technical (ecophysiological) plus social (economic) aspects, in the context of smallholders and their constraints are still scarce, but at least some credible examples exist.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Acknowledgments

The authors acknowledge the authors of seven articles contributed to the special collection's climate risk management in smallholder agriculture.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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